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PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of

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Attn: PCT Branch

Application No. US National Stage of PCT/DK00/00054

Filed: July 23, 2001 Docket No.: 110171

For: AN ELECTRIC MULTIPOLE MOTOR/GENERATOR WITH AXIAL MAGNETIC FLUX

SUBMISSION OF THE ANNEXES TO THE INTERNATIONAL PRELIMINARY EXAMINATION REPORT

Director of the U.S. Patent and Trademark Office
Washington, D.C. 20231

Sir:

Attached hereto are the annexes to the International Preliminary Examination Report (Form PCT/IPEA/409). The attached material replaces claims 1-40.

Respectfully submitted,

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Amended Claims:

1. An electrical machine comprising:

a rotor secured to a shaft with an axis of rotation, said rotor comprising a plurality of magnets or means for producing a magnetic field,

a stator with air gaps formed between the rotor and the stator, said stator comprising a plurality of separate pole cores having corresponding separate coils or set of windings wound on and surrounding said pole cores, said pole cores being arranged so that at least a portion of one or more of the pole cores is arranged at an angle to the axis of rotation, said angle being equal to or greater than 0 degrees and below 90 degrees, and said pole cores providing part(s) of one or more magnetic flux paths,

wherein a magnetic flux path includes two and only two pole cores and two and only two air gaps.

2. An electrical machine according to claim 1, wherein the plurality of magnets or means for producing a magnetic field are arranged in pairs having poles of similar polarity facing each other.

3. An electrical machine comprising:

a rotor secured to a shaft with an axis of rotation, said rotor comprising a plurality of magnets or means for producing a magnetic field,

a stator with air gaps formed between the rotor and the stator, said stator comprising a plurality of separate pole cores having corresponding separate coils or set of windings wound on and surrounding said pole

cores, said pole cores being arranged so that at least a portion of one or more of the pole cores is arranged at an angle to the axis of rotation, said angle being equal to or greater than 0 degrees and below 90 degrees, and said pole cores providing part(s) of one or more magnetic flux paths,

wherein the plurality of magnets or means for producing a magnetic field are arranged in pairs having poles of similar polarity facing each other.

4. An electrical machine according to claim 3, wherein a magnetic flux path includes flux paths through two pole cores.

5. An electrical machine according to claim 4, wherein a magnetic flux path includes two and only two pole cores and two and only two air gaps.

6. An electrical machine according to any one of the claims 1-5, wherein each separate pole core has a corresponding separate coil or set of windings.

7. An electrical machine according to any one of the claims 1-6, wherein the rotor is arranged so that at least part of the rotor is substantially perpendicular to the axis of rotation

8. An electrical machine according to any one of the claims 1-7, wherein the angle is equal to or below 45 degrees.

9. An electrical machine according to any one of the claims 1-8, wherein the angle is equal to or below 30 degrees.

10. An electrical machine according to any one of the claims 1-9, wherein at least a portion of one or more of the pole cores is substantially parallel to the axis of rotation.

11. An electrical machine according to claim 10, wherein one or more windings or coils have their axis substantially parallel to the axis of rotation.

12. An electrical machine according to any one of the claims 1-11, wherein one or more pole cores have a portion arranged substantially perpendicular to the axis of rotation of the shaft.

13. An electrical machine according to claim 12, wherein one or more windings or coils have their axis substantially perpendicular to the axis of rotation.

14. An electrical machine according to any one of the preceding claims, wherein the rotor is circular.

15. An electrical machine according to any one of the claims 1-14, wherein the stator further comprises a magnetic conductive end plate connected to said pole legs or cores.

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16. An electrical machine according to claim 15, wherein the end plate is arranged substantially parallel and opposite to the rotor.

17. An electrical machine according to any one of the claims 1-16, wherein the number of pole cores equals the number of magnets or means for producing a magnetic field.

18. An electrical machine according to any one of the preceding claims, wherein the magnets or means for producing a magnetic field are located radially and equidistantly in the rotor.

19. An electrical machine according to any one of the preceding claims, wherein the magnets or means for producing a magnetic field are located on one side of the rotor facing ends of the pole cores.

20. An electrical machine according to any one of the claims 1-18, wherein the magnets or means for producing a magnetic field are located on the outer periphery of the rotor.

21. An electrical machine according to claim 18, wherein pole shoes are arranged between the magnets or means for producing a magnetic field.

22. An electrical machine according to any one of the preceding claims, wherein magnets or means for producing a magnetic field are arranged on the rotor to fit substantially into a V-shape.

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23. An electrical machine according to claim 22, wherein the magnets or the means for producing a magnetic field are arranged in pairs to obtain said V-shape.

24. An electrical machine according to any one of the preceding claims, wherein the machine is a synchronous one phase machine.

25. An electrical machine according to any one of the preceding claims, wherein the magnets or means for producing a magnetic field are permanent magnets.

26. An electrical machine according to any one of the claims 1-25, wherein the magnets or means for producing a magnetic field are electromagnets.

27. An electrical machine according to any one of the preceding claims, wherein a winding or coil is formed by a flat concentrated coil.

28. An electrical machine according to any one of the preceding claims, wherein the pole cores are assembled of a magnetic conducting material.

29. An electrical machine according to claim 28, wherein the magnetic conducting material is a field oriented soft magnetic lamination.

30. An electrical machine according to any one of the preceding claims, wherein the machine is a generator which may be provided with a mechanical force/power via

said shaft to generate an electrical power via said windings.

31. An electrical machine according to claim 30, wherein said machine is used in a wind turbine.

32. A multiphase machine, wherein a number of phases is obtained by arranging a corresponding number of one phase machines according to any one of the claims 24-31 in series.

33. An electrical machine according to claim 22, wherein the magnets or means for producing a magnetic field are arranged on the rotor to fit substantially into two or more V-shapes.

34. An electrical machine according to claim 33, wherein each V-shape comprises a pair of magnets or means for producing a magnetic field.

35. An electrical machine according to any one of the claims 1-11, wherein the pole cores are formed by U-shaped elements, said elements being arranged in the stator so that one pole core is formed by two adjacent legs of two U-shaped elements.

36. An electrical machine according to claim 35, wherein a magnetic flux path is going through two pole cores and having its path in both legs of one U-shaped pole core element.

37. An electrical machine according to any one of the preceding claims, wherein the pole cores are made of a magnetic conducting material, and wherein the pole cores are arranged on a stator plate made of a material having a low magnetic conductivity.

38. An electrical machine according to any one of the preceding claims, wherein the width of a pole core is substantially equal to the distance between two successive pole cores.

39. An electrical machine according to claim 21, wherein the width of a pole shoe at the outer periphery of the rotor is substantially equal to the width of a pole core oppositely arranged in the stator.

40. An electrical machine according to any one of the preceding, wherein a first stator is arranged opposite to and facing a first side of the rotor, and a second stator is arranged opposite to and facing the other side of the rotor.